National Transportation Safety Board

Enhancing General Aviation Safety: NTSB Investigations, Managing Fatigue, and New GA Safety Alerts

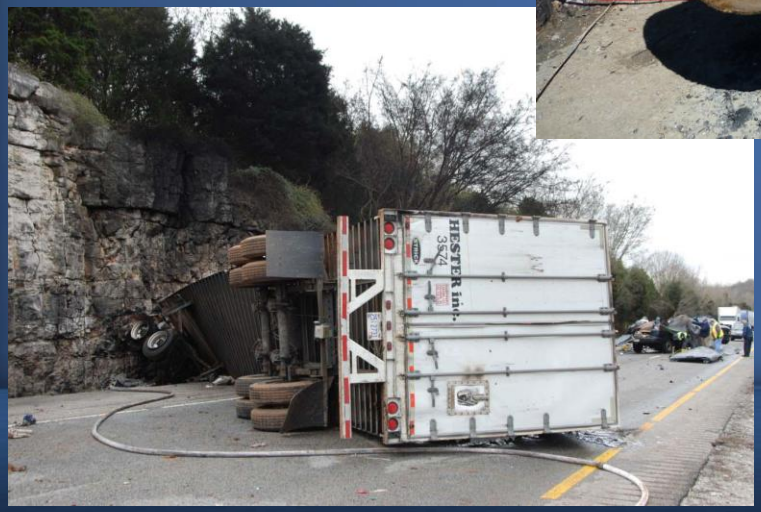
Mark R. Rosekind, Ph.D.
Board Member

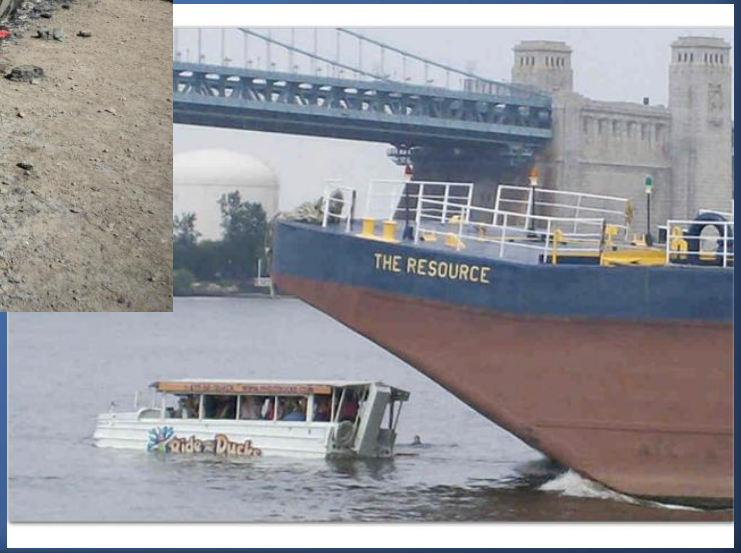
Spruce Creek Safety Meeting
March 24, 2013

1) determining the probable cause of transportation accidents

2) making recommendations to prevent their recurrence

All Modes





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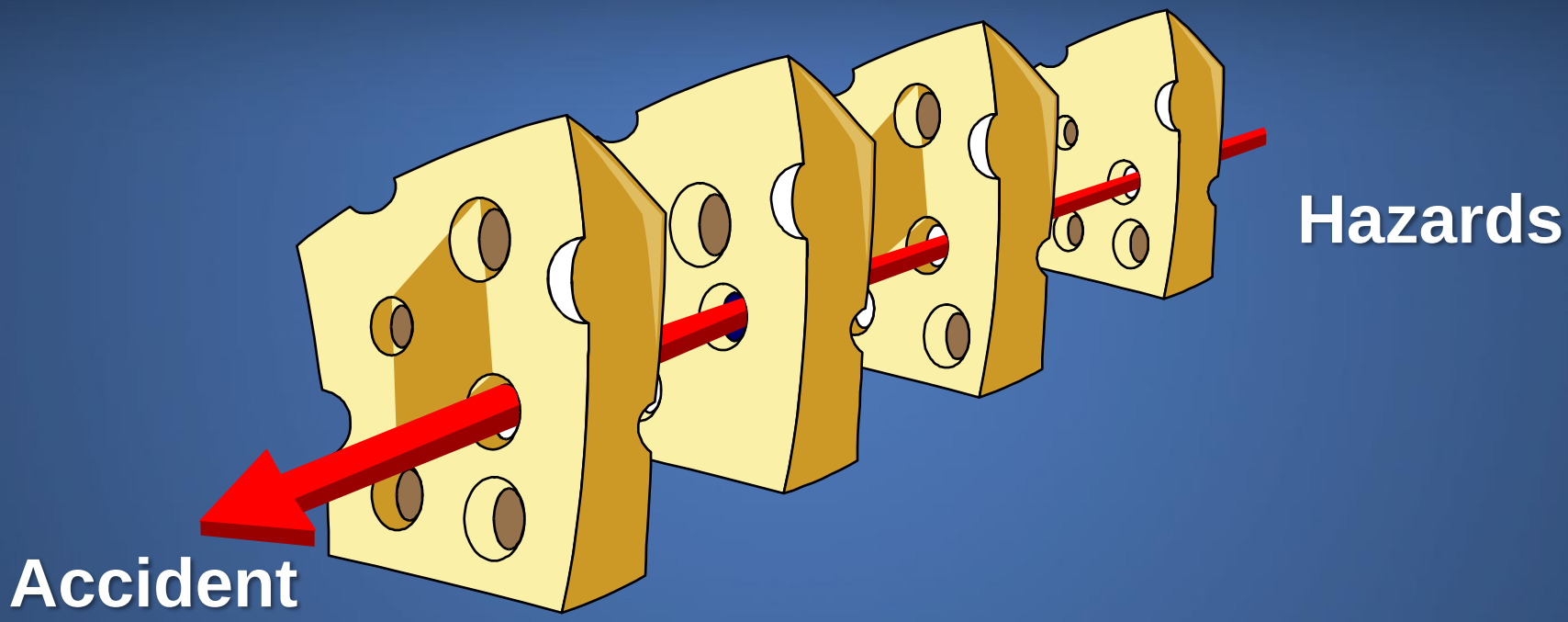
Independent Federal Agency: Created in 1967

- ~ 132,000 accident investigations
- 13,500+ safety recommendations
- ~ 2,500 organizations/recipients
- 82% acceptance rate

“Swiss Cheese” Model (Reason)



Successive layers of defenses, barriers, and safeguards

NTSB Go Team: 24/7/365

- Individual investigator
- Regional/limited team
- Major launch/Board Member

Key On-scene Events

Organizational Meeting

- Designate parties and party coordinators
- Establish and organize groups

Progress Meetings

- Summarize findings
- Info for briefings

Family Briefings

Press Briefings

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NTSB Investigative Process

On-scene Investigation

- Organizational Meeting
- Groups and Parties
- Progress meetings
- Media Briefings
- Press Releases

Preliminary Report

- Factual information

Public Hearing

- Fact finding
- Depositions
- Witnesses
- Docket

Board Meeting

- Docket
- Findings
- Conclusions
- Probable Cause
- Safety Recommendations

Final Report

Government in the Sunshine Act

NTSB Characterized as:

‘moral compass and industry conscience’

NTSB Chairman Deborah A.P. Hersman

Go! Flight 1002

- early starts, multiple segment days, sleep apnea

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Honorable John K. Lauber:

No Accident ≠
Safe Operation

Uncontrolled In-Flight Collision with Terrain
AIA Flight 808, Douglas DC-8-61, N814CK
U.S. NAS, Guantanamo Bay, Cuba, August 18, 1993

First NTSB aviation accident investigation
to cite fatigue as probable cause

- acute sleep loss, sleep debt, circadian disruption

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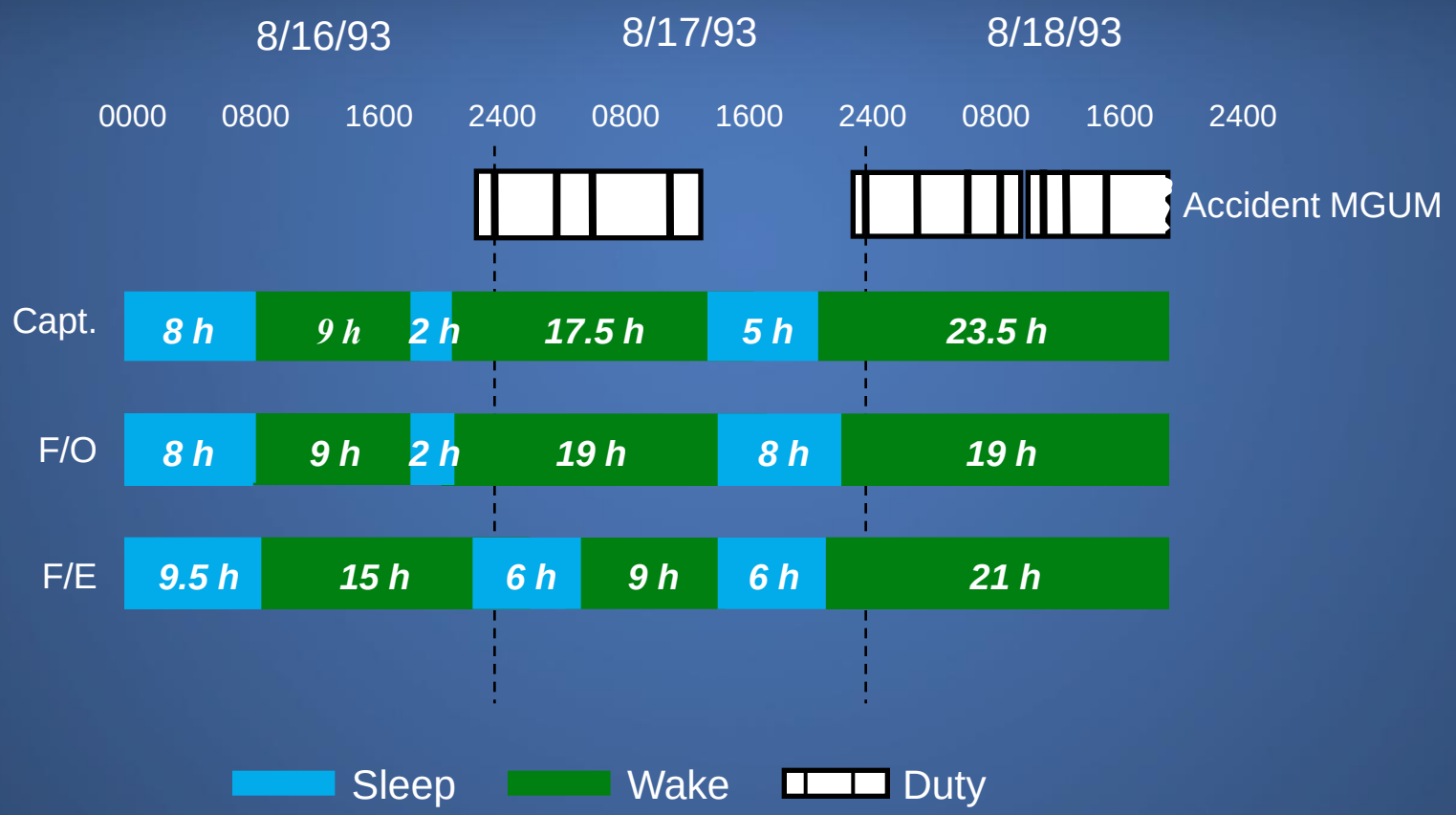
Crew Sleep History



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Observed Performance Effects

- Degraded decision-making
- Visual/cognitive fixation
- Poor communication/coordination
- Slowed reaction time

Uncontrolled In-Flight Collision with Terrain
AIA Flight 808, Douglas DC-8-61, N814CK
U.S. NAS, Guantanamo Bay, Cuba, August 18, 1993

"The National Transportation Safety Board determines that the probable causes of this accident were the impaired judgment, decision making, and flying abilities of the captain and flight crew due to the effects of fatigue…"

Owatonna, MN (July 31, 2008)

8 fatalities

NTSB

Owatonna Crew Fatigue Factors

- acute sleep loss (Capt/FO)
- cumulative sleep debt (FO)
- early start time (Capt/FO)
- excessive sleep need (Capt)
- insomnia (FO)
- self-medicate/prescription sleep med (FO)

Probable Cause/Contributing Factors

"Contributing to the accident were . . . (2) fatigue, which likely impaired both pilots' performance; . . ."

GA Accident: GULF OF MEXICO (February 17, 1994)

THE PILOT FELL ASLEEP WHILE ENROUTE FROM SPRINGFIELD, KY TO CROSSVILLE, TN WHEN HE AWOKE 5 HOURS LATER HE FOUND THAT HE WAS OVER THE GULF OF MEXICO, 210 MILES SOUTH OF PANAMA CITY, FL, AND HAD ONLY 20 MINUTES OF FUEL REMAING. HE DECLARED MAYDAY ON 121.5 AND WAS ASSISTED BY COAST GUARD AND AIR FORCE AIRCRAFT. THEY DIRECTED HIM TO THE NEAREST AIRPORT, ST. PETERSBURG, FL WHILE ENROUTE TO THE AIRPORT THE ENGINES QUIT DUE TO FUEL EXHAUSTION AND THE AIRCRAFT WAS DITCHED, 70 MILES WEST OF ST. PETERSBURG. HE WAS RESCUED BY A COAST GUARD HELICOPTER.

GA Accident: GULF OF MEXICO (February 17, 1994)

- The National Transportation Safety Board determines the probable cause(s) of this accident to be:

  THE PILOT'S PHYSIOLOGICAL CONDITION (FAILURE TO REMAIN AWAKE) RESULTING IN EXTENDED FLIGHT OVER WATER FOLLOWED BY FUEL EXHAUSTION, TOTAL LOSS OF ENGINE POWER, AND DITCHING BEFORE RETURNING TO LAND.

Challenges of a 24/7 Society

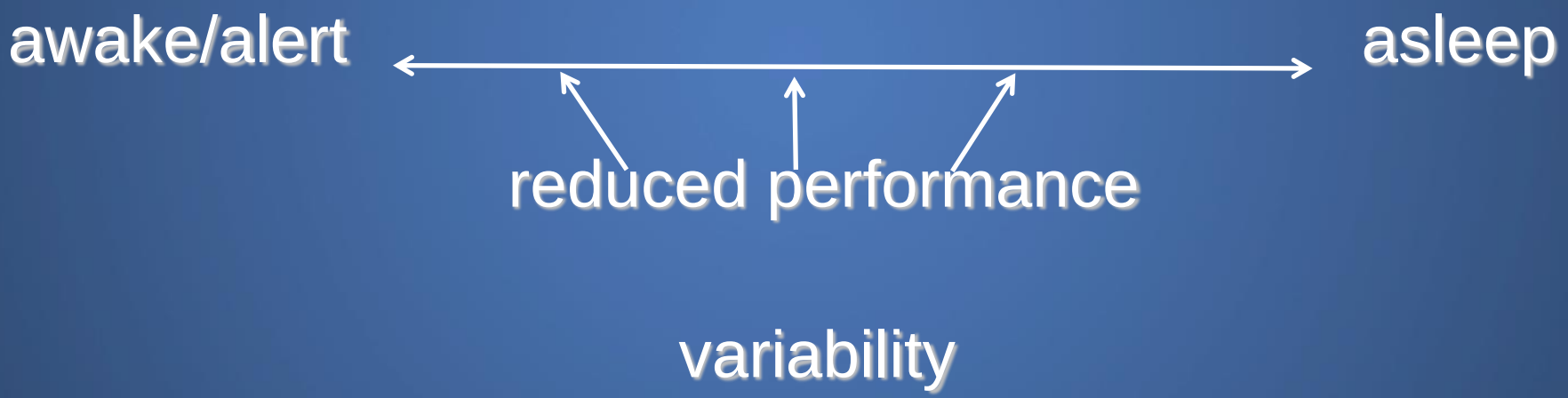
Fatigue Risks

Fatigue can degrade every aspect of human capability.

Four Fatigue Factors +

- Sleep loss
- Continuous hours of wakefulness
- Circadian/time of day
- Sleep disorders
- Other considerations

Fatigue Risks



Fatigue Risks

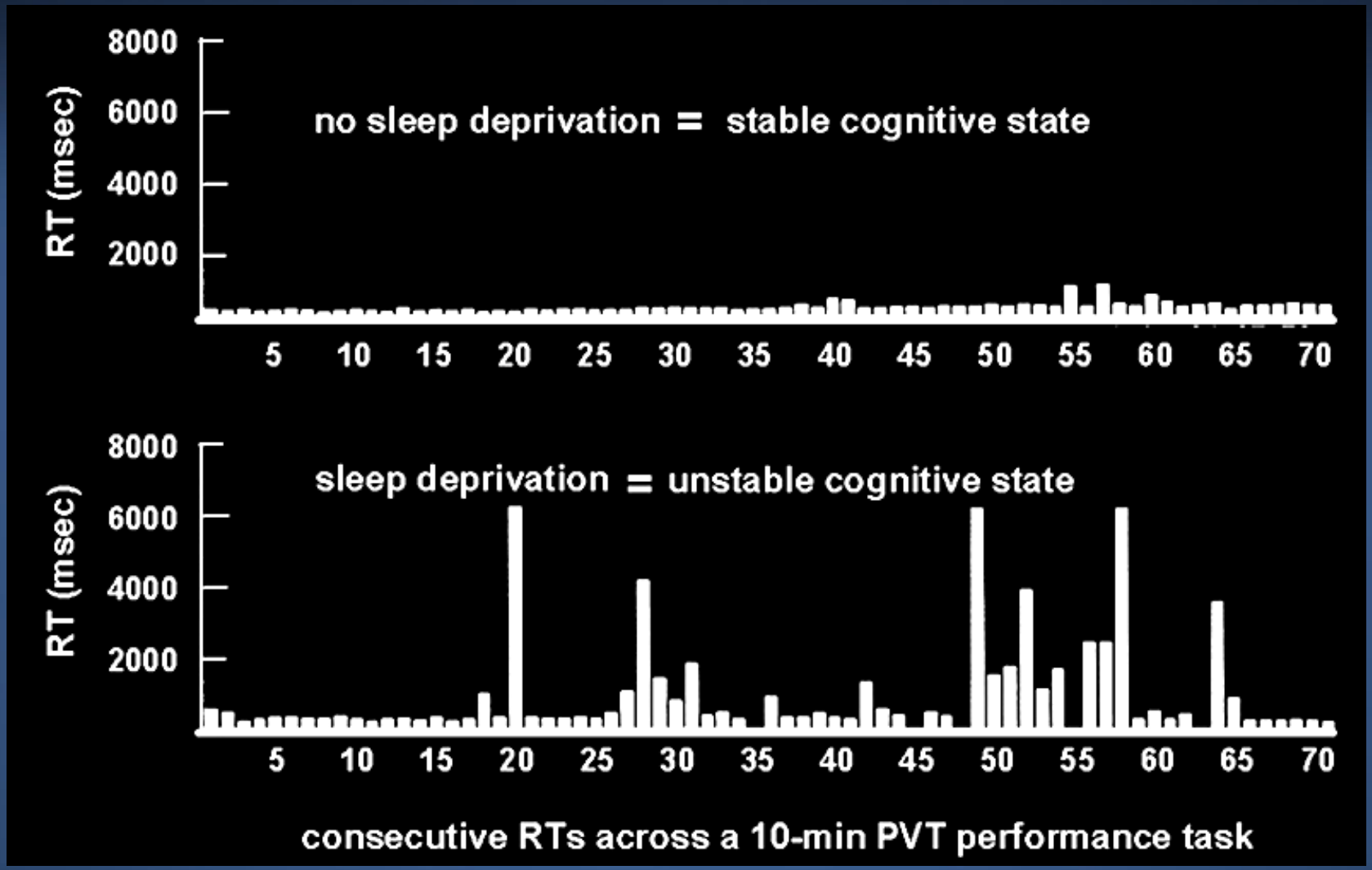
- degraded 20 – 50%+:

  - reaction time
  - memory
  - communication
  - situational awareness
  - judgment
  - attention
  - mood

- increased:

  - irritability
  - apathy
  - attentional lapses
  - microsleeps

Fatigue and Reaction Times



Doran SM, Van Dongen HP, Dinges DF. Sustained attention performance during sleep deprivation: evidence of state instability. *Archives of Italian Biology: Neuroscience* 2001;139:253-267.

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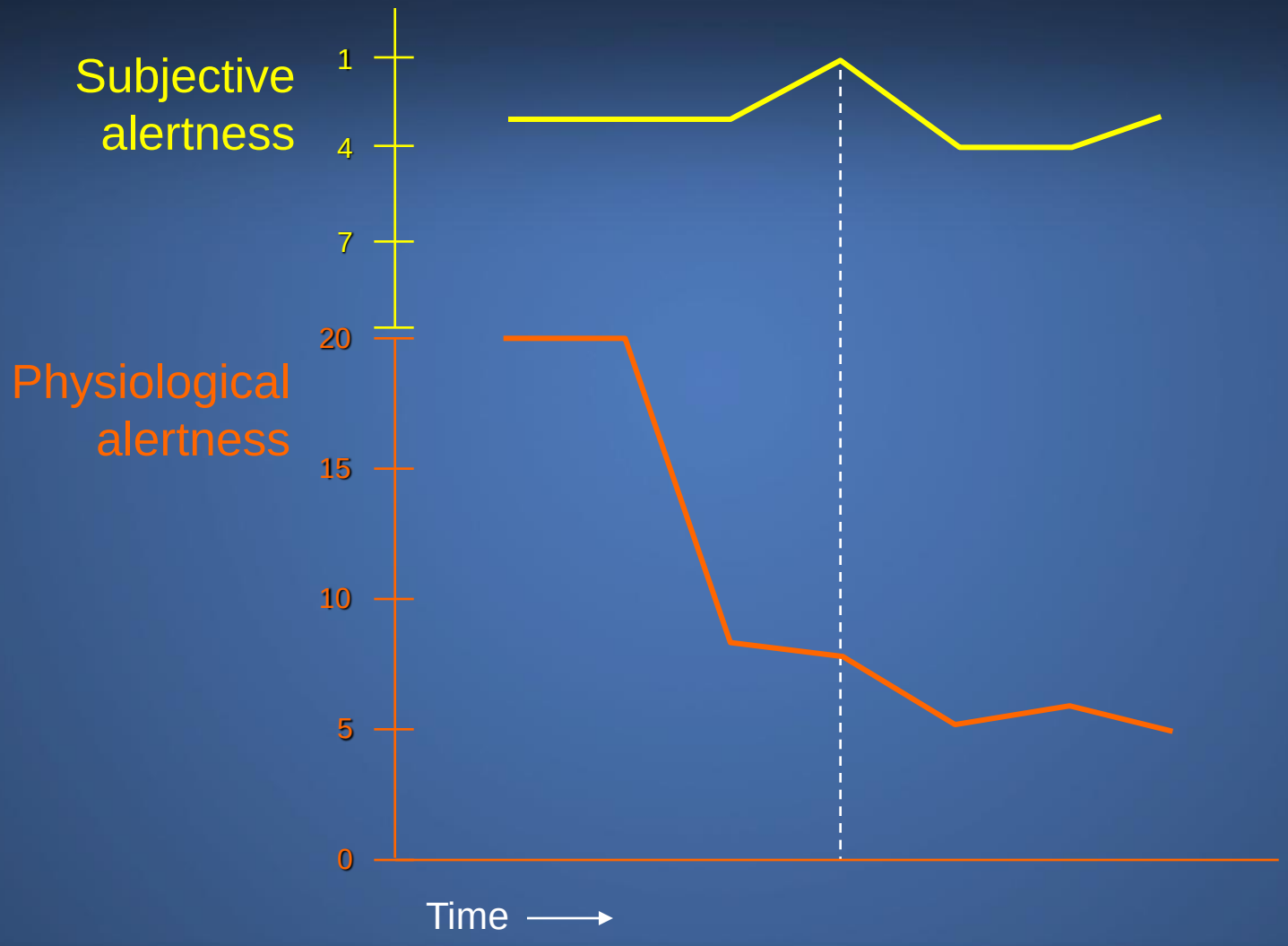
Alertness Reports Often Inaccurate



Adapted from Sasaki et al., 1986

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NTSB Safety Recommendations: Fatigue

- 40 years ago: May 10, 1972
- “Revise FAR 135 to provide adequate flight and duty time limitations.” (A-72-55)
- Classified “Closed-Unacceptable”

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Home > Transportation Safety > Most Wanted List

SHARE

MOST WANTED LIST

A program to increase the public's awareness of, and support for, action to adopt safety steps that can help prevent accidents and save lives.
The following are ten of the current issues.

Addressing Human Fatigue

General Aviation Safety

Safety Management Systems

Runway Safety

Bus Occupant Safety

Pilot & Air Traffic Controller Professionalism

Recorders

Teen Driver Safety

Addressing Alcohol-Impaired Driving

Motorcycle Safety

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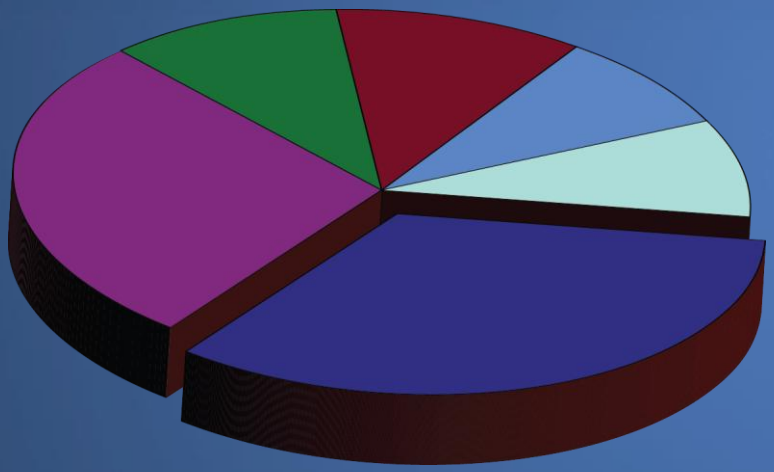
NTSB Recommendations

- MOST WANTED 1990 -2012
- ~200 fatigue recommendations

Complex Issue:



Requires Multiple Solutions

- Scheduling Policies and Practices
- Education/Awareness
- Organizational Strategies
- Healthy Sleep
- Vehicle and Environmental Strategies
- Research and Evaluation

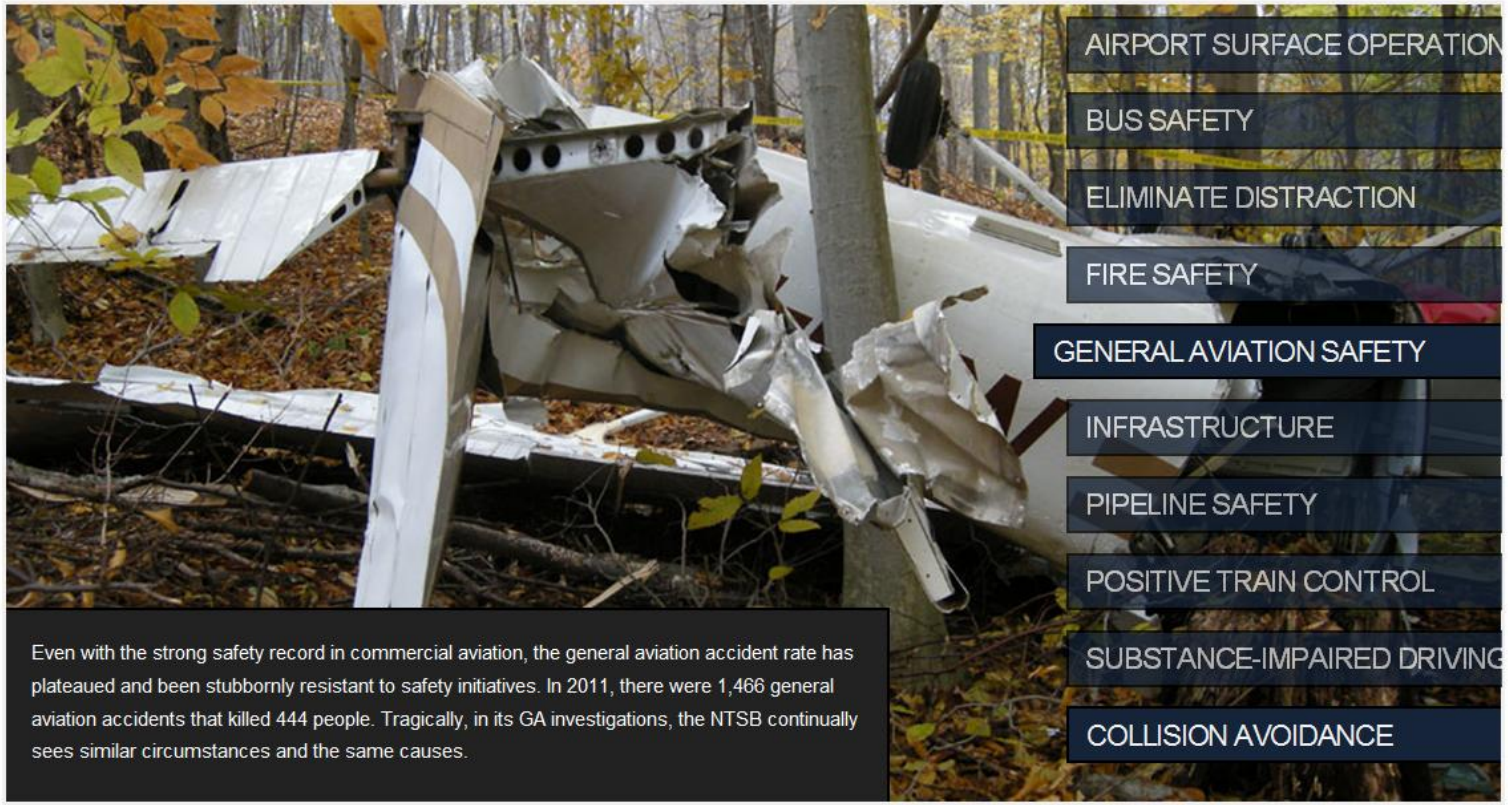
NTSB Recommendations: Education/Strategies

- Develop a fatigue education and countermeasures training program
- Educate operators and schedulers
- Include information on use of strategies: naps, caffeine, etc.
- Review and update materials

Good sleep, safe travels.

Most Wanted List

The Most Wanted List represents the NTSB's advocacy priorities. It is designed to increase awareness of, and support for, the most critical changes needed to reduce transportation accidents and save lives.



Even with the strong safety record in commercial aviation, the general aviation accident rate has plateaued and been stubbornly resistant to safety initiatives. In 2011, there were 1,466 general aviation accidents that killed 444 people. Tragically, in its GA investigations, the NTSB continually sees similar circumstances and the same causes.

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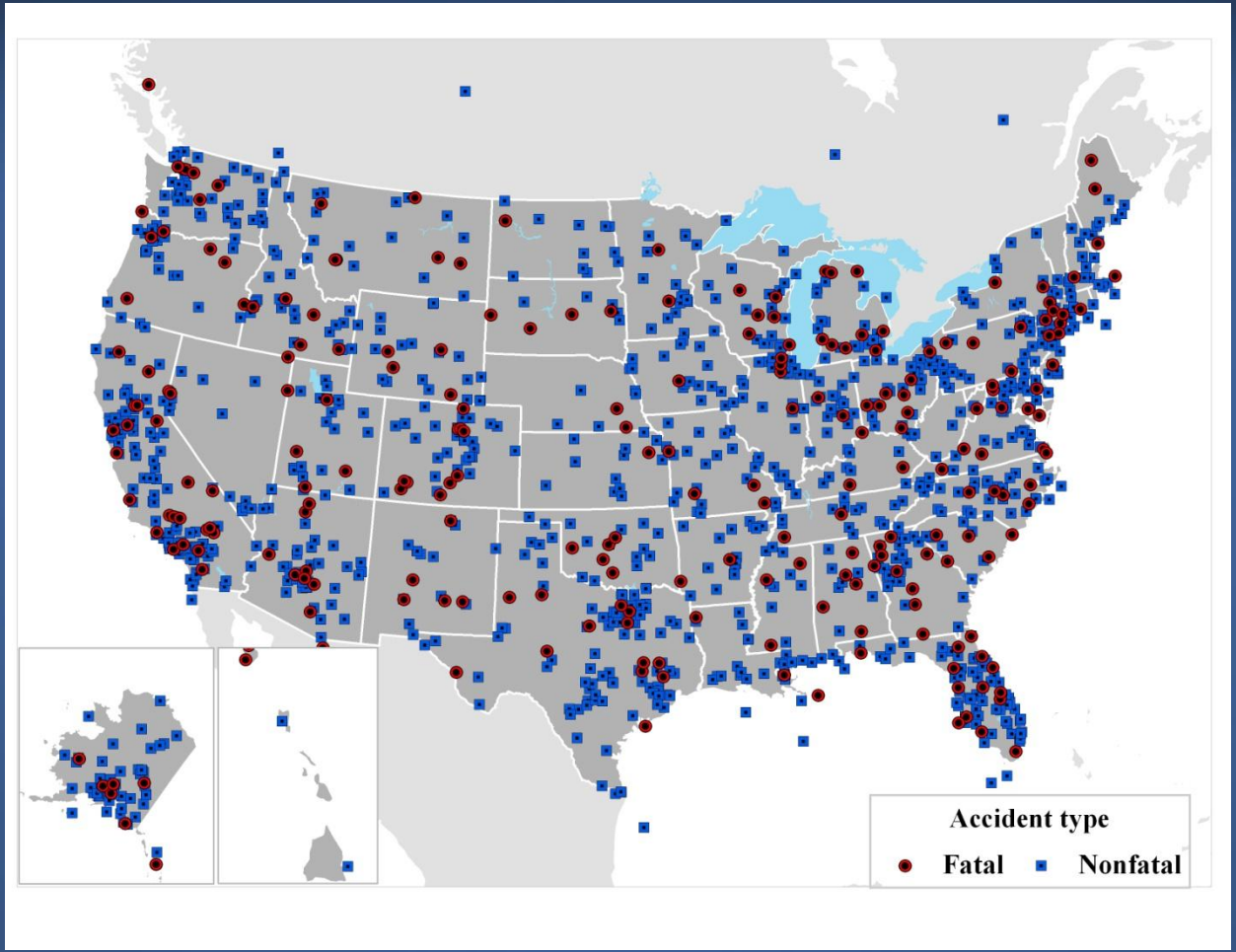
What is General Aviation?

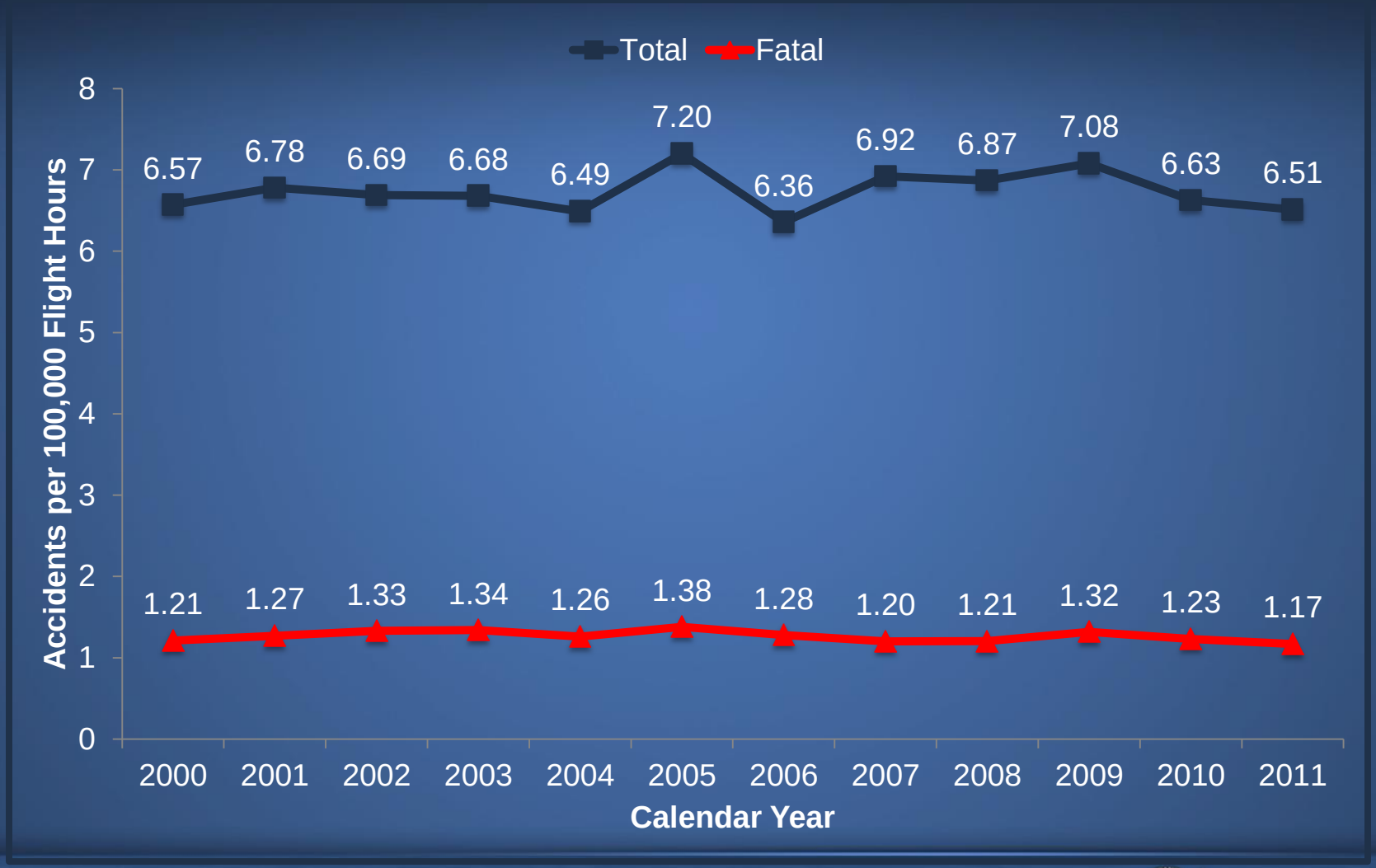
Pilots, Aircraft, and Flight Activity (Estimates)

- 55,000 new student pilot certificates issued (2011)
- 97,000 active flight instructors
- 617,000 active pilots
- 215,000 aircraft active in GA
  - 155,000 of those are fixed-wing, piston-powered
- 21.7 million hours flown in 2010
  - 10.4 million hours were personal/business flights

Geographic Distribution of Accidents



GA Accident Rates



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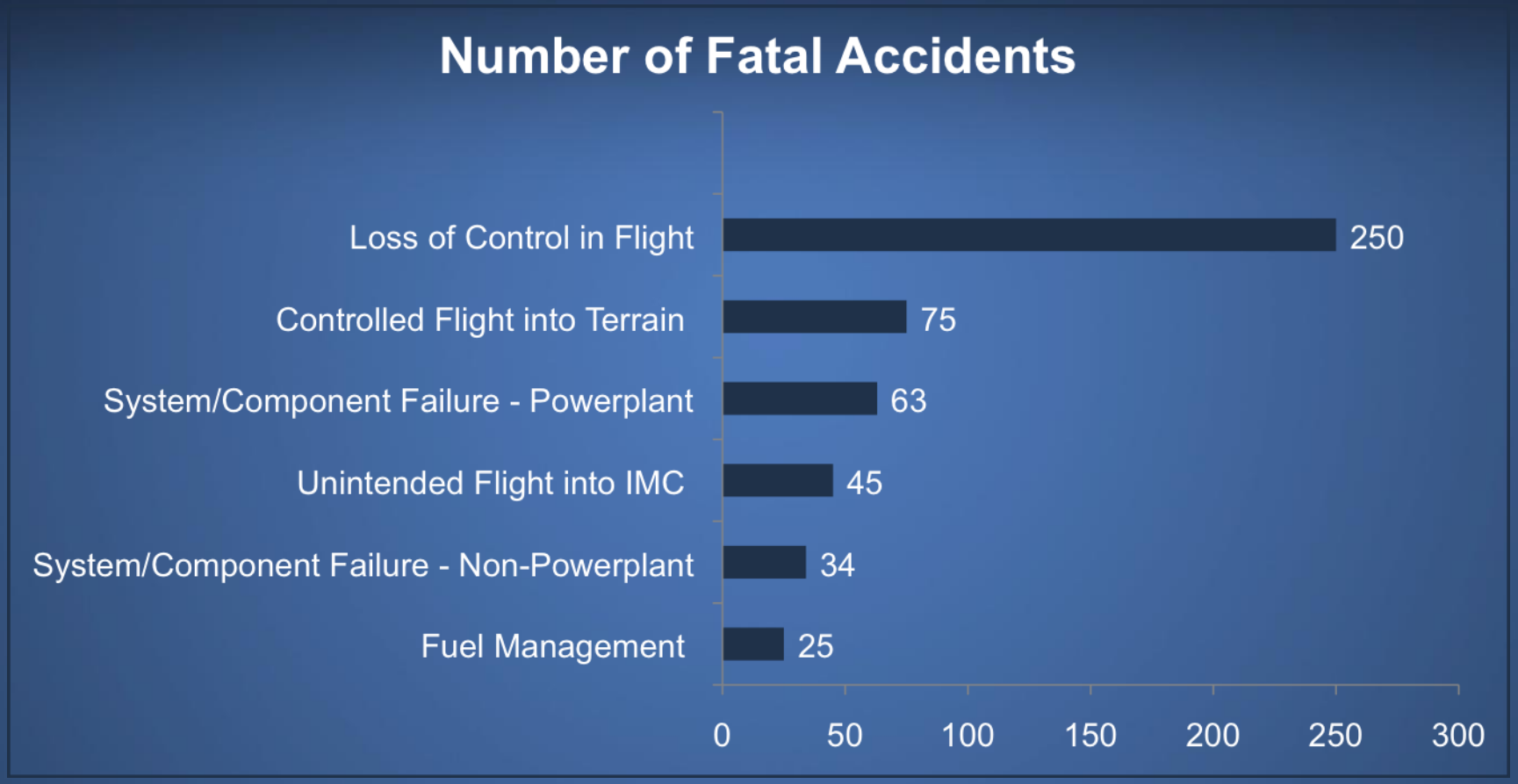
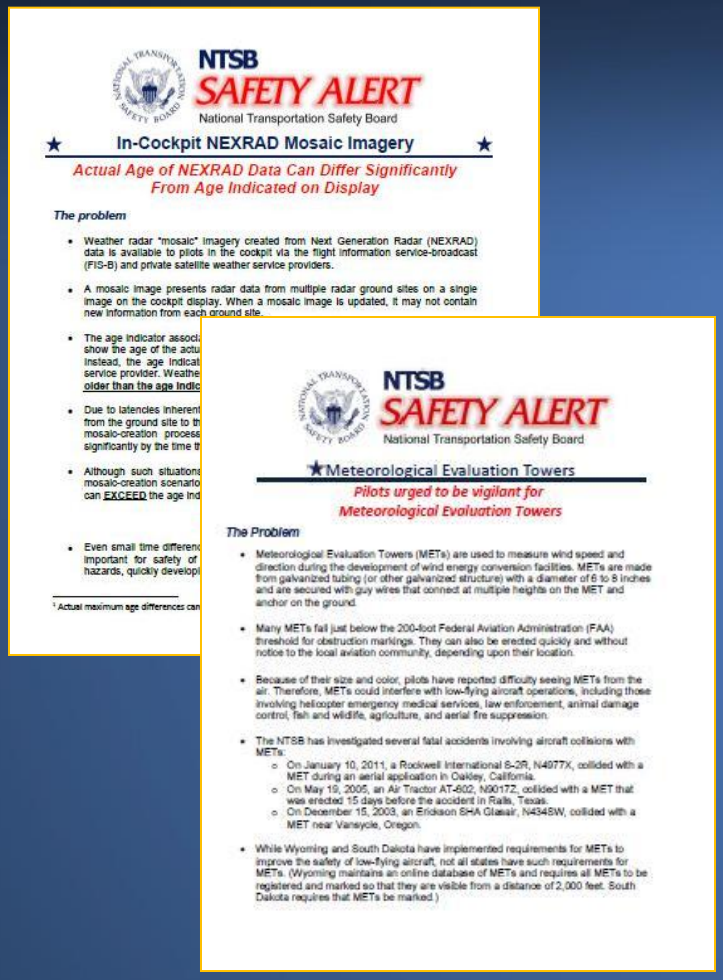
Personal Flying Defining Events





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★ In-Cockpit NEXRAD Mosaic Imagery ★

Actual Age of NEXRAD Data Can Differ Significantly From Age Indicated on Display

The problem

- Weather radar "mosaic" imagery created from Next Generation Radar (NEXRAD) data is available to pilots in the cockpit via the flight information service-broadcast (FIS-B) and private satellite weather service providers.
- A mosaic image presents radar data from multiple radar ground sites on a single image on the cockpit display. When a mosaic image is updated, it may not contain new information from each ground site.
- The age indicator associ… show the age of the actu… Instead, the age indicat… service provider. Weathe… older than the age indic…
- Due to latencies inherent… from the ground site to th… mosaic-creation proces… significantly by the time th…
- Although such situations… mosaic-creation scenario… can EXCEED the age ind…
- Even small time differenc… important for safety of… hazards, quickly develop…

[1] Actual maximum age differences can…

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★Meteorological Evaluation Towers

Pilots urged to be vigilant for Meteorological Evaluation Towers

The Problem

- Meteorological Evaluation Towers (METs) are used to measure wind speed and direction during the development of wind energy conversion facilities. METs are made from galvanized tubing (or other galvanized structure) with a diameter of 6 to 8 inches and are secured with guy wires that connect at multiple heights on the MET and anchor on the ground.
- Many METs fall just below the 200-foot Federal Aviation Administration (FAA) threshold for obstruction markings. They can also be erected quickly and without notice to the local aviation community, depending upon their location.
- Because of their size and color, pilots have reported difficulty seeing METs from the air. Therefore, METs could interfere with low-flying aircraft operations, including those involving helicopter emergency medical services, law enforcement, animal damage control, fish and wildlife, agriculture, and aerial fire suppression.
- The NTSB has investigated several fatal accidents involving aircraft collisions with METs:
  - On January 10, 2011, a Rockwell International S-2R, N4977X, collided with a MET during an aerial application in Oakley, California.
  - On May 19, 2005, an Air Tractor AT-602, N9017Z, collided with a MET that was erected 15 days before the accident in Ralls, Texas.
  - On December 15, 2003, an Erickson SHA Glasair, N434SW, collided with a MET near Vansycle, Oregon.
- While Wyoming and South Dakota have implemented requirements for METs to improve the safety of low-flying aircraft, not all states have such requirements for METs. (Wyoming maintains an online database of METs and requires all METs to be registered and marked so that they are visible from a distance of 2,000 feet. South Dakota requires that METs be marked.)

General Aviation (GA) Safety Alerts

March 12, 2013

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GA Safety Alerts

- Define a GA safety problem
- Provide statistics on the problem
- Provide examples of accidents
- Provide ways to prevent accidents

GA Safety Alert Topics

- Aerodynamic stalls at low altitude
- Reduced-visual references
- Aircraft mechanical problems
- Pilots' risk management
- Mechanics' risk management

GA Safety Alert:
"Prevent Aerodynamic Stalls at Low Altitude"

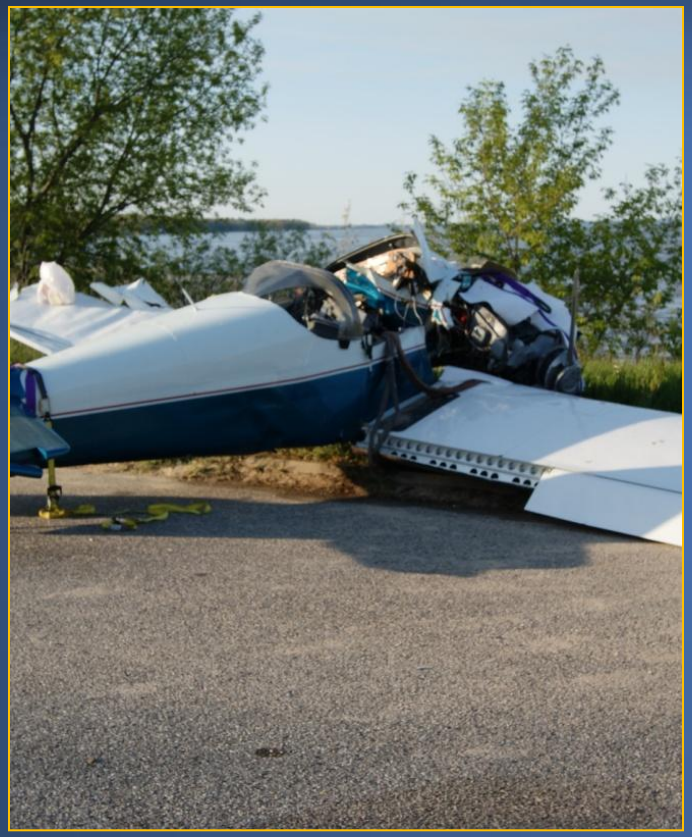
Stall/Spin After Takeoff Accident

Chris Shaver - IIC

NTSB

Stall in Airport Traffic Pattern

Jennifer Rodi - IIC



Aerodynamic Stall During Maneuvers

Craig Hatch - IIC

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What can pilots do?

- Seek training to fully understand stall phenomenon and AOA concepts
- Remember that a stall can occur at any airspeed, in any attitude, and at any engine power setting

What can pilots do?

- Remember that maneuvering loads, other factors increase stall speed
- Reduce AOA at first indication of stall – it's the most important immediate response

What can pilots do?

- Manage distractions when maneuvering at low altitude
- Resist temptation to “show off”
- Understand that stall characteristics can differ substantially between airplanes

GA Safety Alert Topics

- Aerodynamic stalls at low altitude
- Reduced-visual references
- Aircraft mechanical problems
- Pilots' risk management
- Mechanics' risk management

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